

**What Is Claimed Is:**

1. A fuel injector for use with an internal combustion engine, the fuel injector comprising:  
a valve group subassembly including:

a tube assembly having a longitudinal axis extending between a first end  
and a second end;

a seat secured at the second end of the tube assembly, the seat defining an  
opening;

an armature assembly disposed within the tube assembly, the armature  
assembly having an armature face, at least one of the armature face and the inlet  
tube face having a first portion generally oblique to the longitudinal axis;

a member biasing the armature assembly toward the seat;

a filter assembly located in the tube assembly, the filter assembly engaging  
the member and adjusting a biasing force of the member; and

a first attaching portion; and

a coil group subassembly including:

a solenoid coil operable to displace the armature assembly with respect to  
the seat; and

a second attaching portion fixedly connected to the first attaching portion.

2. The fuel injector according to claim 1, further comprising:  
a lift sleeve telescopically disposed within the tube assembly a predetermined distance to  
set a relative axial position between the seat and the tube assembly.
3. The fuel injector according to claim 1, further comprising:  
a crush ring disposed within the tube assembly proximate the seat.
4. The fuel injector according to claim 1, wherein the first portion is generally arcuate.
5. The fuel injector according to claim 1, wherein the first portion is generally frusto-  
conical.

6. The fuel injector according to claim 1, wherein the armature face is hardened.
7. The fuel injector according to claim 6, wherein the armature face is heat treated.
8. The fuel injector according to claim 6, wherein the armature face is at least one of plated and coated.
9. The fuel injector according to claim 1, wherein the inlet tube has a first tube portion and a second tube portion connected to the first tube portion.
10. The fuel injector according to claim 1, wherein the tube assembly further comprises a non-magnetic shell, the non-magnetic shell includes a guide extending from the non-magnetic shell toward the longitudinal axis.
11. The fuel injector according to claim 1, wherein the armature assembly further comprises an intermediate portion coupled between a magnetic portion and a sealing portion, the intermediate portion adapted to magnetically decouple the magnetic portion and the sealing portion.
12. The fuel injector according to claim 1, wherein the coil group subassembly further includes:
  - a first insulator portion generally surrounding the first end of the tube assembly; and
  - a second insulator portion generally surrounding the second end of the tube assembly, the
- 5 first insulator portion being bonded to the second insulator portion.
13. The fuel injector according to claim 1, wherein the valve group subassembly is symmetric about the longitudinal axis.

14. The fuel injector according to claim 13, wherein the tube assembly includes a valve body and a shell, the valve body engages the shell in a plane generally transverse to the longitudinal axis.

15. The fuel injector according to claim 13, wherein the tube assembly includes a valve body and a shell, the valve body engages the shell along an annular surface generally parallel to the longitudinal axis.

16. The fuel injector according to claim 1, wherein the filter is conical with respect to the longitudinal axis.

17. The fuel injector according to claim 1, wherein the filter has a cup shape and has an open filter end and a closed filter end.

18. The fuel injector according to claim 17, wherein the open filter end is proximate the seat.

19. A method of manufacturing a fuel injector, comprising:  
providing a valve group subassembly comprising:

a tube assembly having a longitudinal axis extending between a first end and a second end, the tube assembly including an inlet tube having an inlet tube face;

a seat secured at the second end of the tube assembly, the seat defining an opening;

an armature assembly disposed within the tube assembly, the armature assembly having an armature face, at least one of the armature face and the inlet tube face having a first portion generally oblique to the longitudinal axis;

a member biasing the armature assembly toward the seat;

an adjusting tube located in the tube assembly, the adjusting tube engaging the member and adjusting a biasing force of the member;

15                   a filter assembly located in the tube assembly, the filter assembly engaging  
the member and adjusting a biasing force of the member; and  
a first attaching portion;  
providing a coil group subassembly including:  
a solenoid coil operable to displace the armature assembly with respect to  
the seat; and  
20                   a second attaching portion;  
inserting the valve group subassembly into the coil group subassembly; and  
connecting the first and second attaching portions together.

20.     The method according to claim 19, wherein the armature includes at least one radial  
facing surface, the method further comprising:  
masking the at least one radial facing surface; and  
hardening the armature face.